USER'S GUIDE
to the
BUCHLA 700

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User's Guide to the Buchla 700

rev 0	Jan 1, 1988
1	April 19, 1988
2	May 19, 1988
3	June 20, 1988
4	July 19, 1988
5	August 29, 1988
6	December 15, 1988
7	Jan 17, 1989

This revision is for use with MIDAS VII version 890111.01 or higher

Users are invited to send written suggestions with the purpose of enhancing the accuracy, comprehensibility, and transmission efficiency of future editions of this document. Elaborations, tutorial examples, diagrams, even comments pertaining to form, grammar, and spelling will be appreciated. Send markups, additions, etc. to us at:

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And do call us with those unsurmountable problems (415) 528-4446.

As of this date, MIDAS VII is essentially complete. Peculiar single, double, and triple braces surround various uncertainties as follows:

{this function not implemented}
{{this function may be changed}}
{{{this function has a bug}}}

1.00 SETUP

Unpack the instrument and confirm the presence of:

this instruction manual
1 diskette
1 A.C. power cord

With the exception of the headset connector, all 700 connectors are located on the rear panel. Begin by plugging the A.C. power cord into an appropriate receptacle.

Connect the main audio outputs to the sound system of your choice. Output connectors are standard 1/4" phone jacks; output level is about 1 volt. Medium or high impedance headsets may be plugged into the front mounted stereo jack.

Connect an EGA or Multisync video monitor to the 700's video output. An adapter cord appropriate for connection to an IBM computer is necessary. Follow the manufacturers instructions to prepare the monitor for EGA display (digital, TTL levels, 64 colors, 21.8 kHz scan frequency).

Connect a MIDI source to the MIDI 1 input. Many additional connections are possible, but unnecessary for initial familiarization; their special requirements will be discussed in subsequent sections.

2.00 LOADING A PROGRAM

Power on the system, remove the dummy diskette, and insert the program diskette into the drive located on the right side of the instrument. (The 700's power switch is on the upper left hand corner of the front panel.) Press the first green switch (immediately to the right of the controller marked "scroll") to initiate loading. In due time the program's name and version number will appear on your screen along with a menu of possibilities. Adjust your monitor if necessary, and proceed to the section of this manual that introduces the selected program.

3.00 MIDAS VII INTRODUCTION

MIDAS VII is an advanced high level music language designed to provide the Buchla 700 user with a facility for characterizing, performing, and interacting with his/her instrument. It is a "user friendly" language, requiring no programming experience or computer expertise. MIDAS VII is a comprehensive language - while simple musical tasks are easily accomplished, the language is far from trivial, and as experience and musical desires escalate, MIDAS VII will accommodate increasingly sophisticated instrumental and musical concepts.

MIDAS VII consists of several functional units, each with its own display and purpose, and all sharing common editing procedures and modes of access. Major functional units will be dealt with as separate sections, starting with:

4.00 FETCHING WITH THE LIBRARIAN

The MIDAS librarian stores and retrieves various sorts of data to and from disks. We begin our tour of MIDAS VII here so that some sample sounds may be loaded into the instrument, which will then be used for tutorial purposes in subsequent sections.

First, place your finger toward the center of the cursor pad (a 2 inch square located above keys 21 and 22), and practice moving the cursor (a little arrow) around the video screen. Position the cursor in the box labeled "Librarian", and press the "E" key, which is located to the right of the cursor pad. This is a common procedure for accessing information or entering data in MIDAS VII. The librarian display will now appear.

{In addition to the MIDAS program, the diskette provided contains sample orchestras (collections of instruments), a score, and collections of assignment tables, waveshape tables, and tuning tables.} To view the disk's contents, move the cursor to "Index", and press "E".

The 700 can stash 40 instrument definitions in its internal memory, ready for immediate access. These instruments are organized into two banks, referred to as the "lo orchestra" (instruments 1 -20), and the "hi orchestra" (instruments 21 - 40). Each orchestra record on the disk contains 20 instruments; the lower left field in the display determines where the instruments wind up when fetched from disk. To change this field, position the cursor on "Lo/Hi orch" and toggle with the "E".

To load the sample orchestra, set this field to "Lo orch", move the cursor to the desired record, in this case "Orchestra Tutorial". Press "E", confirm that the highlighted record is indeed the one you wanted, press "E" again, wait for the load operation to complete, and return to the main menu by pressing the "M" key. "M" performs this function from any of MIDAS's displays.

5.00 THE INSTRUMENT DESIGNER

The sonic output of the 700 is defined with the instrument designer. Here's where time varying functions (envelopes) are specified for each variable, waveshapes are selected, the effect of performance gestures on various aspects of the sound is determined, and the configuration of the elements that make up a voice is selected. And here's a good place for a brief explanation of the somewhat elaborate architecture of the 700.

5.05 A voice may use up to four oscillators, each of which can contribute directly to the final acoustic output, or can be used to modulate other elements (or both modes simultaneously). The pitches of the oscillators may be individually determined, or they may track each other with any desired interval.

Oscillator signals are routed through digital versions of VCAs (voltage controlled amplifiers), and it is these DCAs (digitally controlled amplifiers) that establish amplitudes and modulation intensities. There are, for each voice, six DCAs, and six corresponding indices that control their gain. The 700 provides for three different kinds of modulation: amplitude modulation (A.M.), frequency modulation (F.M.), and timbre modulation (T.M.). All are potentially useful techniques for generating complex and interesting sounds; the first two have been employed by the broadcast industry for decades, while the latter is unique to Buchla's recent instruments. Postponing detailed presentation of the intricacies and implications of modulation, we will simply point out that when used in combination, these techniques can provide us with a rich and varied electronic vocabulary.

The signals generated by the interconnection of oscillators and DCAs are routed through two waveshape tables, a 24 db/octave filter, a voltage controlled amplifier (VCA) and then through circuitry that deals with location, dynamics, {equalization}, and aural excitation. The last elements are part of the output section, and will be dealt with eventually; the instrument editor is finished with its job once a signal exits the VCA.

5.10 One further digression - then we'll get on with the details of instrument definition. The 700 employs a hierarchic library structure that results in considerable flexibility, but needs a bit of explanation. As we've mentioned, there are 40 instruments stored in the 700's memory-based library at any given time, divided into entities known as the low orchestra (instruments 1-20) and the high orchestra (21-40). A default instrument (number 0) is also in the library, but can't be edited, replaced or stored - only played. (What? only one factory preset?) Additionally, there are twelve more instrument slots, one associated with each of the twelve voices. The instruments stashed in these slots are the ones we can hear and see via the instrument designer. From the main menu, call the instrument designer by appropriately positioning the cursor and pressing "E".

Creation, editing, and audition of instruments is only possible for instruments attached to voices; instruments can be copied into the library from voices, and can be attached to voices by retrieving them from the library. The disk only communicates with the library, and only in groups of 20 instruments at a time. This structure, diagrammed in figure 2, allows for easy re-arrangement of instruments within orchestras as well as permitting the user to save versions of instruments for comparison while experimenting with modifications.

The voice number indicates the voice whose attached instrument we're currently editing; to change voices, position the cursor in this field, type in the desired number (1-12), and press "E". To move an instrument between the voice and the library, select a number (1-40) and position the blinking cursor on "Fetch from library" to move an instrument from the library to the current voice, or on "Copy to library" to move the current instrument into the library. Press the "E" again to initiate the transaction. To view the names of the instruments in the current library, position the cursor on "Inst", and press "E". Repeat this action to restore the display.

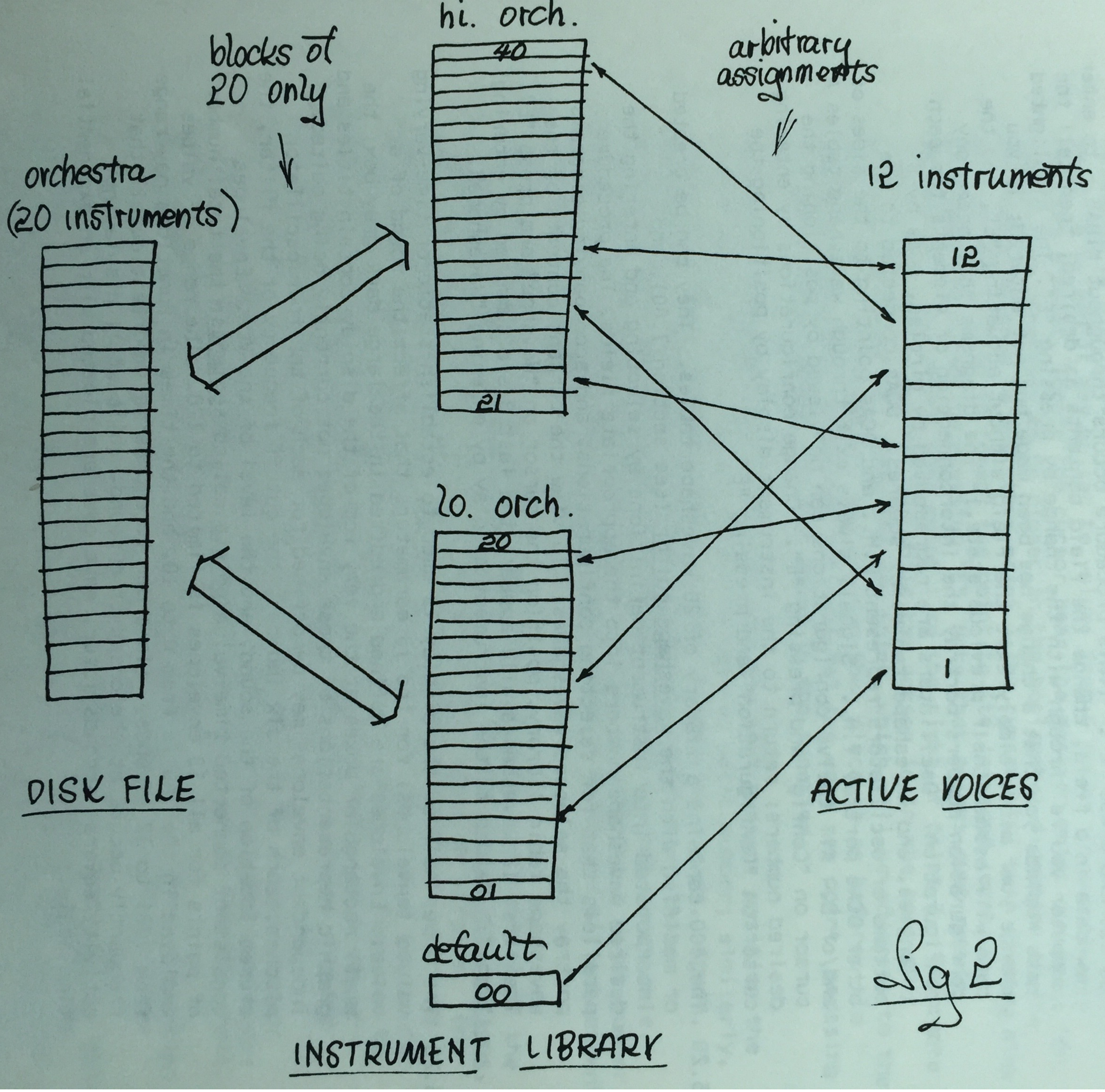
orchestra
(20 instruments)
blocks of
20 only
hi. orch.
40
21
lo. orch.
20
01
default
00
arbitrary
assignments
12 instruments
12
1
DISK FILE
INSTRUMENT LIBRARY
ACTIVE VOICES

fig 2

When defining or altering an instrument, it is sometimes advantageous to audition it monophonically. (Normally the editing and auditioning apply to the group to which the selected voice is currently assigned - see section 9.10 for explanation of "group".) Activate the "edit" switch (located in the upper left section of the front panel) to achieve this state of affairs. Toggle it to return to the polyphonic mode (LED off).

5.15 To change the instrument configuration, enter the desired number (1-12) and press "E". (This procedure occurs throughout MIDAS - to enter new data in a field, change the field contents as desired; then tell the computer you're through with the change by pressing "E". The highlighted data reminds you that a change has been made but not entered; if you change your mind, simply exit the field without actuating "E", and the data will assume their previous state.) The diagrams that accompany configuration numbers portray the interconnection of elements for each configuration. Oscillators are represented by circles, DCAs by triangles, and waveshape tables by squares. DCAs connected to the bottoms of oscillators represent F.M., and DCAs pointing to the sides of other DCAs portray T.M.. Signals always exit through waveshape tables A and/or B. All twelve configurations can be viewed by positioning the cursor on "Config" and pressing "E". Change configurations by entering desired numbers; return to the instrument display by positioning the cursor on "Configuration" and pressing "E".

5.20 The 700 contains a library of 20 waveshape tables. They can be created or modified with the waveshape editor (see section 7.00), and incorporated into instrument definitions by selecting and entering the desired waveshape numbers into the appropriate fields. The procedure parallels that for selecting configurations, and accompanying diagrams portray the selected waveshapes. To view the current contents of the waveshape table library, position the cursor on "Wavshpe" and press "E". The first 12 waveshapes will appear; the last 8 are summoned by entering "Page". Return to the instrument display by entering "Waveshape".

5.25 The upper half of the display is used to establish static or time-varying values (envelopes) for the 13 parameters that affect the sound of a voice. Envelopes are defined and edited in the large dark gray box; the small rectangular boxes at the very top of the display contain titles and graphic representations of those envelopes not currently being edited. Independent envelopes may be defined for each of the four oscillator pitches, each of the six indices, the cutoff frequency of the filter, the stereo location of the sound, and the level of the VCA. Envelopes consist of connected time-value points called segments; the total number of points for all 13 envelopes is limited to 128. The range of values employed in the 700 is from 0 to 10, and the times in functions may range from .001 to 32 seconds. (In order to emphasize important detail that frequently occurs at the onset of a sound, while still displaying activity several seconds later, envelopes are plotted with an exponential time scale.)

To access a parameter's envelope for editing, position the cursor in the appropriate box and press "E". (For convenient reference, the level envelope is simultaneously displayed at subdued intensity.) The first point is present for all parameters, shows up as a dot on the left side of the screen, and represents the initial default value for the displayed variable. For indices and level, this value is 0, and for oscillator frequencies, filter frequency, and location, it is 5.0. The filter's resonance is displayed along with its frequency envelope. Its default value is 0, and it may be set to values from 0 to 9. To graphically relocate a point, locate the cursor near the desired point and press "E". (It is only necessary to be closer in the horizontal direction to the desired point than to any other point.) The cursor will turn flaming pink and can now be used to "drag" the point to its intended location. Disengage the cursor by pressing "E". Note that points must remain sequential - you cannot move point 1 to the right of point 2. To create a new point, press the "+" key while the cursor is in the main edit window; the cursor will grab the new point, which will be adjacent to the last point in the function, and you can then place it as before. To create a succession of points, activate "+" for each new point, pressing "E" when you've located the last point in the function.

Points may alternatively be located with the text cursor; position the cursor in the "Pt" field and enter the desired point number; similarly, enter the desired time and value in their respective fields. Again, sequence must be preserved - times shorter or longer than those associated with the previous or subsequent points are not acceptable. Functions and portions thereof may be deleted by entering a point number in the "Pt" field and pressing "X"; the selected point and all subsequent points in the function will vanish.

5.30 Normally, a function proceeds in an orderly fashion from point 0 to the largest numbered point and then stops. But certain conditional actions, associated with specific points, can alter this state of affairs. One frequently used conditional action is the sustain function, which is realized by telling the function to "pause if key down" at a particular point in the level function. Other actions will cause the function to proceed or jump backwards or forwards a specified number of times or until the initiating key changes state. Note that up arrows signify released keys, down active keys. The action "GoTo __ __ times" interprets the 2nd data field in a peculiar manner for numbers larger than 89; entering a 9 produces an "R" in the first digit and randomizes the number of jumps executed, with the upper limit set by the 2nd digit.

To program a conditional action, first select the point where the action is to occur; position the cursor in the left side of the "conditional action" field (first six characters) and press "+" or "-" until the desired action appears. Press "E"; then enter further data into the data field(s) by the usual method. Note that when jumping to a point, the interpolation time is the time programmed for the segment that precedes that point. (To reduce this time while preserving a function's shape, add an extra dummy point to serve as the jump's destination.) To delete an action, use the "+" or "-" keys to select a blank field and press "E".

5.35 Functions are normally started by the key closure or other stimulus that calls the voice to which an instrument is dedicated. Alternatively, a function may be initiated by the action of attaching the instrument to a voice, and when in this mode, will not respond to key closures. To change function start modes, position the cursor in the function display box and press "-"; a white legend indicates that key start is on, gray for key start off.

5.40 Much of the expressive potential of any musical instrument depends on sometimes rather complex relationships between a musician's gestures and the instrument's acoustic response. Such relationships are established in the 700 by directing sources to influence variables by certain degrees called multipliers. To view a sub-menu of possible sources, position the cursor in the far left "source" field and press "E".

Of the nine possible sources, four assume different meanings when originating from different sorts of controllers; sources in the first column, when a MIDI keyboard is in control, come from the pitch wheel, the modulation wheel, and if used, a breath controller. The source labeled "GPC/V1" (stands for general purpose controller) responds to whatever controller number is currently assigned to it (more on this in section 9.45). When the voice in question is under local control (from the 700's touch keyboard), these four sources become the horizontal and vertical axes of the x/y tablet (the larger 2 dimensional pad), the longpot (the long empty area just above the row of 24 keys), and control voltage input # 1 (on the 700's rear panel).

The "Pch/Frq" source is derived from the actual pitch currently being sounded by the 700's digital oscillators. There are two possible relationships: "Pch" increases linearly according to the note value, with each successive interval adding a fixed amount, whereas "Frq" increases exponentially, doubling each octave, and only becoming significant at very high pitches.

"Key vel" (key velocity) is produced by most MIDI sources, but has no meaning when local control is invoked. "Key Prs" (key pressure) is generated polyphonically by the 700, but most MIDI controllers issue key pressure (sometimes called "aftertouch") monophonically. MIDAS can sense and adapt to any of these possibilities, so not to worry.

The "Random" source is bi-directional, generating positive and negative values with equal probability. The sign of the multiplier determines the nature of the randomness: a positive multiplier causes a "box" distribution, with equal probability from values of -5 to +5, while a negative multiplier calls forth a pseudo-Gaussian distribution with tails ending at values of -10 and +10.

"Pedal I" is an analog input (range 0 to 10 volts) on the 700's rear panel when in local control; when controlled by a MIDI device, MIDAS looks at controller #4, unless an alternate number has been programmed in the assignment table.

There are two places that sources and their accompanying multipliers can be entered. When entered as "general sources" (via the fields on the far left), they are activated on the next key closure that calls the edited voice, and thereafter operate continuously, affecting the value of the parameter independently of the function's progress in time. And when entered as "point sources" (the fields to the immediate right of the "value" field), they affect only the point in the function to which they are attached. The value used here is derived from the source at the beginning of the segment that precedes the point in question, and its influence is zero by the end of the subsequent segment. The net effect is simply that the value of a specific point in a function can be determined or modified by a source. Multiple sources can influence different points in varying degrees - the implications for expressive control would seemingly invite experimentation. Points that have sources or conditional actions associated with them are displayed in yellow in the graphic representation of the function.

Sources can be deleted by positioning the cursor in the source field and typing "X".

5.45 The pitches of the four oscillators may be specified in several ways. If a frequency or a pitch is specified, the oscillator will ignore the controller and tuning table, and generate a fixed frequency from 0 to 15.9 Hz or a pitch from pedal C (16.35 Hz) to C9 (8372 Hz). For an interval or ratio, oscillator 1 will sound the pitch called for by the tuning table offset by the interval or ratio, whereas oscillators 2, 3, and 4 will track oscillator 1 with the declared offset. Intervals are specified in cents (1 cent = 1/100 semitone), and ratios are indicated as fractions (a ratio of 4/3 would represent an interval of a perfect fourth). Oscillator data is displayed in a box headed "Oscillators", with the oscillator numbers in the left column.

To enter oscillator data, position the cursor in one of the type fields (immediately right of the oscillator numbers), scroll through the possible data types with the "+" key, and press "E" when you find the desired type. Then move the cursor to the data field and enter the desired data. Pitches are entered as an octave between 0 and 9, a note between A and G#, followed by a positive displacement in cents; sharps are entered with the "9" or "+" key, flats with the "8" or "-" key, and naturals with the "7" key. Oscillators 1, 2, or 3 may be phase synchronized to number 4 by entering a "+" in the "s" field, which will become a capital "S", and may be unsynced by entering a "-" in this field.

5.50 To name an instrument, position the cursor at the first character of the name field, and press "E". Upper and lower case characters, digits and symbols will appear, along with a second cursor. Move this cursor to the desired character, press "E", and repeat. To move cursor 1 around, position cursor 2 on one of the lines that surround the "*" and press "E". Add comment in similar fashion, and when finished enter an "*" to escape from the "conceptual typewriter".

A red instrument number cautions the user that the current instrument is not stored in the library. If you wish to save it, copy it to an appropriate slot in the orchestra library as described in section 5.10.

5.55 To delete an entire instrument, position the cursor at the instrument number and press "X".

6.00 THE FRONT PANEL

The previous sections have introduced us to some of the 700's front panel, but here we will systematically describe all of the presently applicable switches, controls, and indicators.

6.10 To the right of the self-evident power switch are located two push button switches. The "reset" switch initializes the state of the instrument, setting all parameters to their nominal values, wiping out all data, and, unless you have a terminal connected, awaiting only one logical action - that of loading a new program. So use it sparingly and with care. The "edit" switch may assume different meanings for different displays, but for most of MIDAS, it restrains us to playing only the voice that is currently displayed in the instrument designer. "Display intensity" adjusts the contrast of the LCD display to accommodate variations in ambient light or viewing angle, and "voice activity" lights indicate the level values for each of the 12 voices.

6.20 In the next row, "tempo mult" modifies the indicated score tempo, while "time scaling" affects just about all other times in the instrument (excepting tempo). Use the latter to compress or expand envelopes and time varying functions from their nominal values. "Fine tuning" adjusts the tuning of all voices by up to one semitone in either direction, and "amplitude" governs the main output levels (but not the individual voice outputs). Light emitting diodes associated with the first three controls indicate exact centering, enabling precise digital accuracy for tempo, time and pitch.

6.30 A conceptual flywheel, labeled "scroll" is used to position the score display. The 14 touch switches to the right of "scroll" are used to initiate various system actions and to establish the meanings of the 14 slide controls immediately below. The LCD (liquid crystal display) shows the switch functions, which may change occasionally, and also displays the current assignments and levels of the slide controls.

6.40 To the right is a section used to enter information while editing. An array of ten keys is usually used to enter numeric data, and occasionally serves to enter note names (A-G) or perform other functions. A large square, called the "cursor pad" is used to move the cursor, and keys labeled "X", "E", and "M" are generally used to delete things, enter data, and return to the main menu.

6.50 The large square on the left is akin to a performance joy-stick, is called the x-y tablet, and can be assigned by the instrument editor as a "source" for control of various instrumental variables. The row of 24 keys can serve as a "local" controller, and when so designated, the keys numbered 1 to 24 are mapped into the tuning table as MIDI inputs (see section 8.20 for more details). A "longpot", located immediately above these keys can function as yet another performance source, and the little dots above the longpot are LEDs (light emitting diodes) that serve as status indicators for various purposes, including step entry of notes in the MIDAS score editor. A replaceable magnetic strip below the keys potentially labels them for this or other specialized functions.

6.60 The LCD is used in conjunction with the 14 touch switches, the 14 slide controls (frequently), and the 24 keys (occasionally) to perform certain tasks, some of which are throughly explained in subsequent sections and all of which we shall at least mention here. The top row of the display comprises labels for the 14 switches. From left to right:

"Quiet" resets system variables to default values; use it to clear a hung note. "ROMP" is a debugging aid for use by Buchla and Associates. Destined to eventually disappear, its use will kill the program, requiring reloading MIDAS from disk to proceed.

The display is illuminated by an electroluminescent lamp, which has a finite life expectency (about 10,000 hours to half brightness). Activation of a touch switch or slide control turns on the lamp, which is extinguished 2 1/2 minutes later. To defeat this conservation feature, press "Lamp"; when underlined, the lamp will stay on until toggled off.

"Clock", "P/R", and "Go To" expedite certain score-related functions; they are explained in section 10.

"Instr" provides an alternate method of selecting instruments. To do so, press the corresponding switch; the meanings of the switches will change. Next, use the first twelve switches to select the group(s) whose instrumentation you wish to alter. (More on groups appears in section 9.10.) Initially, all are selected, as indicated by the arrows pointing to the numbers. Then select the instrument you wish assigned to the designated groups. Instrument 0 (default instrument) is selected by pressing the 14th key ("Deflt"). Instruments 1 - 20 (low orchestra) are selected by activating the corresponding performance key. To select an instrument from the top 20 (high orchestra), press the 13th key before activating a performance key; an offset of 20 will be added to the key number. Subsequent activation of this key provides an escape route to the normal mode (with no instrument selected).

"Asgmt" is used to select assignment tables, and is explained in section 9.70.

"Load", followed by a letter (A-G), causes similarly labled files from the currently inserted disk to be loaded without the need for accessing the library display. More on this in section 11.40.

The 12th switch ("Other") controls the functions of the slide controls. Initially, they are assigned to the various voice parameters, as shown in the lower line of the display. Useful in performance or in the editing of instruments (to quickly hear the effect of a contemplated change for example), the control settings are added to the programmed values, but are not stored as part of instrument definitions. Initially, they affect all 12 voices, but this may be altered by pressing the key labeled "Voice", and then toggling the numbered keys to select the voice(s) to be addressed by these controls. Activate "Voice" again to return the switch functions to normal. "Init" restores the touch controls to their normal settings, with zero offset, and thus no influence on the sounds. This zero is midpoint for "Locn", "Freq", and "Filtr", and is at the bottom for the remaining controls.

Activate "Other" to attach the slide controls to other system variables. "Aux" controls the modulation of an external signal (section 9.25). "Depth", "Rate", and "Intensity" are phase shift variables (section 9.35). "CV1,2,3,4" directly set control voltages that appear on the rear panel for use with external voltage-controlled apparatus. Subsequent activation of this switch, now labeled "Prmtr", will return the slide controls to their initial function of controlling the various voice parameters.

7.00 THE WAVESHAPE EDITOR

The 700's waveshaping capabilities contribute substantially to the timbral range of the instrument. Each voice can simultaneously address two waveshape tables; a total of 24 are active and directly associated with the 12 voices. Additionally, a library of 20 waveshape tables may be stashed in memory, awaiting application as new instruments are created. Note that waveshape tables become part of instrument definitions - changes in the library do not affect extant instruments.

Waveshape tables may be regarded as transfer functions, and in conventional systems, with phase angle inputs, their outputs are cyclic replicas of the stored waveforms. Not quite the case in the present instrument - the 700 utilizes continuous input functions of varying amplitude and complexity, and the resultant output is a multidimensional function of several variables that yields particularly rich timbral possibilities. Some fundamentals are in common with the two methods; steep transitions result in the generation of higher ordered harmonics, rules of symmetry apply with regard to the generation of odd versus even ordered harmonics, and for a given input function there exists a table that will produce a desired harmonic structure.

7.10 The 20 waveshape tables provided as a sample library is a rather comprehensive resource, but if you just have to have more, then here's how to roll your own. Access the waveshape editor from the main menu; then clear the displayed waveshape by locating the cursor in the waveshape field and pressing "X". The resultant straight line is about the simplest waveshape that can exist - it says that what goes in comes out. Several means exist for modifying this line:

7.20 First, let's try moving individual points. Position the cursor in the graphic field, and press the "+" (or "-") key until a "0" appears in the "width" field. Locate the cursor horizontally so that it is vertically aligned with a point you would like to move, and press "E". The cursor will ignite and grab the point, which you may now move in the vertical direction. If you're listening to the voice to which this waveshape table is attached, you will hear the (probably raspy) affect of moving the point each time you pause. (The waveshape table is updated when the cursor is stationary.) If you would like to influence some adjacent points with the same gesture, increase the "brush" size by pressing "E" to disengage the cursor and press "+" or "-" keys to change the "brush width". Larger numbers influence bigger chunks, with each increment doubling the number of points affected. Edit the line as before, and note the response to changing the "brush width".

If desired, define the position of a point by entering a number between 0 and 253 in the "point" field, and enter the desired vertical coordinate in the "value" field (between -1023 and +1023). (We doubt that anyone would want to do this.)

7.30 Another method of drawing waveshapes is to define points of inflection and instruct the computer to "connect the dots". With the cursor in the waveshape display, press "+" or "-" until "width" becomes "interp". Define the first point by positioning the cursor horizontally and pressing "E"; then locate this point vertically. Type a "+" and position the cursor at the next desired inflection point, repeating this sequence until all desired points are defined; terminate by pressing "E" for the last point.

7.40 Waveshapes can additionally be defined by specification of harmonic coefficients. Locate the cursor under the desired harmonic number and press "E". Now move the red arrow cursor up; an element of a bar gragh of harmonic coefficients will be created, and its value (between -100 and +100) will be displayed. The magenta line portrays the offset waveshape, and the green line is the result of summing this initial offset with the harmonically defined waveshape. Negative values indicate 180 degree phase reversal, and are entered with the "-" key. When the desired level is achieved, press "E" again to enter the data and disengage the cursor.

7.50 To move a waveshape table to or from the library, enter the desired waveshape number (1-20) and then enter a "store" or "fetch". To view the waveshape tables currently attached to a particular voice, enter a number from 1 to 12 and an "A" or "B" in the "voice" and "slot" fields. The "instrument" field is not modifiable; it just displays the instrument currently played by the indicated voice.

8.00 TUNING TABLES

As you might suspect, the 700 can be tuned to any imaginable scale. There are 128 possible key addresses produced by a MIDI controller, and for each of these addresses, the 700 can produce a predetermined pitch. The instrument's memory can accommodate 10 tuning tables, numbered 0 through 9. Table 0 is a default (non-modifiable) table; the remaining nine tables can be stored and retrieved as tuning table libraries.

8.10 The tuning table editor is accessed from the main menu. MIDI key numbers are displayed in subdued intensity followed by the corresponding pitches. The first digit represents the octave number (0-9); it is followed by the note (A-G) and a flat or sharp sign or a blank. The subsequent two digit number is the number of cents added to the indicated note. (Each semitone is divided into 100 subdivisions called "cents"; there are 100 cents in each halfstep; 1200 cents per octave). The note names in the far left column correspond to the MIDI key numbers; key 60 is middle C. Pitches may be altered by entering data in the usual fashion. Naturals (blanks), flats and sharps are entered with the "7", "8", and "9" keys.

8.20 Pitches at the ends of the range (0C 00 and 9C 99) are displayed with subdued intensity. A standard 88 key MIDI keyboard transmits key numbers 21 through 108, and a 5 octave (C-C) synthesizer usually produces key numbers 36 through 96. To permit an alternate tuning while using a MIDI controller, the 700's keys are mapped into the unused extremes of the MIDI range, with keys numbered 1 - 14 corresponding to MIDI 1 - 14, and keys 15 - 24 corresponding to MIDI 115 - 124. The default tuning table provides these keys with a range of 8 octaves in intervals of thirds, hardly a musically useful scale, but handy for auditioning an instrument over an extremely wide pitch range.

8.30 To ease the humdrum of entering redundant information, MIDAS VII can generate certain types of tuning tables (or portions thereof) automatically. Here's how to replicate a group of notes with (or without) transposition: Illuminate the "copy and transpose" legend by positioning the cursor in this field and pressing "E"; then enter the desired transposition in the value field (in cents). Now move the cursor to the first note in the group you wish to copy, and press "E"; similarly for the last note in the group. The group of notes you have defined is now in some brilliant color; initiate the action by positioning the cursor at the beginning of the intended destination and again pressing "E". (Sort of like a block move with a word processor.)

Two methods are provided for generating equal interval scales. Use "increment" for a fixed interval: Enter the increment in the value field, select the beginning note, and finally select the point at which you wish the incrementing process to stop. Or if you know the beginning and ending notes and want MIDAS to calculate the intermediate notes, use "interpolate". Ignore the value field; simply chose the two notes at the ends of the range to be interpolated, and MIDAS will fill in the rest.

8.40 MIDAS operates on a single tuning table, selected from a memory-resident library of 10, numbered 0 - 9, with 0 a default (non-modifiable) table. Retrieve a table from the library by entering its number followed by a "fetch"; to store a table in the library, enter the number and then a "store".

8.50 Tuning tables may be named. To do so, position the cursor in the name field, press "E", then use the "conceptual typewriter" to generate the desired name. To view the current library of tuning tables, position the cursor on "Table" and press "E". Repeat the process to return to the tuning table display.

9.00 ASSIGNMENT TABLES

Here's where we tell the 700 what instruments are to be played and who is going to play them. Voices are assembled into "groups", and instrument numbers, dynamic levels, and MIDI channels are assigned for each group. Keyboard splits are determined, MIDI controller numbers may be altered, and certain other variables may be established from the assignment table.

9.05 Select the assignment table editor from the main menu; the default table (00) will appear. This table assigns 8 voices to group 1, to be played by a MIDI keyboard connected to port 1 and transmitting over channel 1. The remaining 4 voices are assigned to group 2 for control by the local ("L") front panel keyboard. The default instrument is assigned to both groups, playing at a dynamic level of "6". All keys from the MIDI controller are active, with no splits called for.

9.10 Before proceeding, we should explain the concept of a "group". Ultimately, each voice of the 700's 12 voices is assigned an instrument to play; in an orchestral situation, we might assign a different instrument to each voice, but more commonly, we'll want several voices to be playing the same instrument, and most likely to be doing so in a polyphonic mode. To simplify the description of complex multi-timbral assignments, MIDAS deals with voices in "groups", assigning from 1 to 12 voices to a group, and a single instrument to a group. The voices within each group are sounded polyphonically; groups played simultaneously are sounded in parallel. Additionally, groups are assigned dynamic levels and the source of control for each group is specified. For MIDI port 1, individual keys can be assigned to specific groups.

9.15 To select a new assignment table, enter its number, move the cursor to "fetch", and press "E". Alternatively, a MIDI program change command may be used for selection. MIDI port 1, channel 1 is initially enabled for program changes; the channel number may be altered if desired, or the feature may be canceled by deleting the data field.

Assignment tables can be selected from the front panel. Press the "Asgmt" key, and an underlined number will appear and one of 20 LED's may light up. The currently active assignment table is the sum of the underlined number (a multiple of 20) and the number beneath the illuminated LED. No light indicates that the default assignment table is currently operative. Select a new table by activating the "Asgmt" key until the desired offset is indicated, and then pressing the appropriate performance key. Use the "Deflt" key to select table 00.

9.20 {The 700 can transmit MIDI codes from the MIDAS score. Enter port 1 or 2 in the "MIDI out" field; the channel numbers are selected elsewhere.}

9.25 Voice 12 may be used to modulate a signal applied to auxiliary input 1. To enable this feature, position the cursor in the "aux" field and press "E"; a red "aux" indicates activation. Modulation may be toggled off by the same process. Modulation depth is controlled from the front panel by activating "Other" and then adjusting the "Aux" control.

9.30 Tuning tables are selected from the tuning table library by entering the desired number in the "Tun" field. The range is from 0 to 9, with 0 a default (non-modifiable) table. Enter "Tun" to view the current tuning table library; repeat to return to the assignment table display.

9.35 Sounds directed towards the center of the stereo output field (other than extreme left or right) can be shifted in phase to enhance their presence. The degree of phase shift is called "intensity". Modulation with variable "depth" and "rate" (.1 to 5 Hz) may be applied to the phase shift. These parameters are set in the "phase shift" section (range of 00 to 99) and may be varied from the front panel by pressing the "Other" key and manipulating the controls labeled "Depth", "Rate", and "Inten".

9.40 To be active, a voice must be assigned to a group. Voices assigned to the same group will be sounded polyphonically (in rotation), and will all play the same instrument. Assign groups to voices by entering the desired group numbers (from 1 to 12) in the "Gr" columns; de-activate voices by deleting associated group numbers.

9.45 MIDAS instruments can respond to six MIDI-transmitted variables; they are, along with their displayed abbreviations:

Pitch wheel	"Pch"
Modulation wheel	"Mod"
Breath controller	"Brth"
General purpose controller	"GPC"
Foot pedal (from the MIDI device)	"Pedal 1"
Key pressure (sometimes called "aftertouch")	"Key Prs"

Each of the above has a corresponding input from the 700’s front panel. The set of inputs used by a group depends on the input device assigned to that group (section 9.50). The panel variables are:

X-Y tablet, horizontal axis	"Hor"
X-Y tablet, vertical axis	"Vrt"
Longpot	"LP"
Control voltage input 1 (0 to 10 volt range)	"CV1"
Foot pedal (from the 700’s rear panel)	"Pedal 1"
Key pressure	"Key Prs"

Some of the MIDI variables utilize controller numbers; the initial "CN"’s are the standard MIDI assignments; they may be altered if desired.

Logically enough, the controller information applied to a group is derived from the MIDI device that has been assigned to control that group. We would not normally expect the modulation wheel on a keyboard controller to affect the sound produced by a MIDI guitar controller. But occasions arise when such interactions are desirable, ususally as a result of one MIDI controller incorporating functions that another could advantageously apply. (example: some keyboards sport breath control and foot pedals, neither of which appear on some guitar controllers, and both of potential use to a guitarist.) Want not - simply position the cursor on the source number (1 - 5 inclusive) and press "E"; the highlighted number indicates the the corresponding controller information can come from any of the 700's MIDI input ports.

9.50 Once a group is defined (by assigning it to one or more voices) it may be endowed with certain characteristics. The data in the "In" column of the upper right box determine the instrument to be played by each group, and the data under "D" select the dynamic level for the each group. Choosing dynamic 6 as our standard loudness (mf = 0db), the remaining numerals will produce the following relative levels:

9 = +6 db (fff)
8 = +4 db (ff)
7 = +2 db (f)
5 = -2 db (mp)
4 = -4 db (p)
3 = -6 db (pp)
2 = -9 db (ppp)
1 = -12 db (pppp)
0 = (tacit)

The next column contains the controller origin for each group. Numerals 1-3 refer to MIDI ports, and the letter "L" calls for "local" control by the 700's touch keyboard. Data are entered in this column by positioning the cursor as usual, pressing "-" or "+" to view the possibilities, and pressing "E" when the desired data type appears. If a channel number is entered in the "Ch" column, the corresponding voice will respond only to the specified MIDI channel, and the MIDI output from the score will be directed to said channel.

{{Currently a number must be assigned for a group to sound.}}

Most MIDI sources can produce note on commands before turning off the previous note. When a guitar controller, with a separate channel assigned to each string, does this on a single channel, the expected response may be a change in pitch without an accompaning restarting of the note. To implement this "legato" response, position the cursor on the desired group number, and highlight the number with the "E". This mode is most useful when a single channel is assigned to a single group is assigned to a single voice, but other combinations will perhaps be of interest.

The instrument library may be viewed by positioning the cursor on "In" and pressing "E"; repeat to return to the assignment display.

9.55 The lower portion of the display is occupied by a matrix relating keys to group numbers; when a particular key calls a group, the corresponding intersection is highlighted. Data are entered by positioning the cursor on a desired intersection and pressing "E" twice. To address a group with a string of adjacent keys, position the cursor at one end of the string, press"E", and relocate the cursor at the string's other end before pressing the 2nd "E". Entries to positions already activated will toggle them off. Note that this facility applies only to MIDI port 1 , and that data cannot be entered for a group unless this assignment has been entered.

9.60 A completed assignment table may be stored in a library of 99 such tables for subsequent recall. To do so, enter the desired number in the "Asgnmnt" field and then enter a "Store". Tables are numbered from 0 to 99, with 0 a default (non-modifiable) table. Tables may be labled by entering athe line under the "Asgnmnt" field and applying the "conceptual typewriter" as described in section 5.50.

10.00 THE SCORE EDITOR

Designed to capture the actions and gestures of performance, as well as to serve the needs of composers working with various media, the MIDAS score editor is an unusually comprehensive facility for storing, manipulating, and recalling sequential musical information. Access the score editor by returning to the main menu and entering the "Score editor". A brief orderly overview of the display will be followed by more detailed guides to various functions.

The sign in the upper left hand corner indicates the notational scheme used for non-natural notes. It may be toggled with the "E", and would generally be # for scores rendered in sharp keys and b for those in flat keys. Differentiation is achieved by slanting the leading edge of accidentals.

For convenient reference, and to facilitate certain editing operations, scores may be arbitrarily subdivided into sections, numbered 1 - 20. The current section number is displayed in the "Sec" field.

Elapsed time, and thus position within a score is measured in "beats" and "frames", with 48 frames comprising one beat. To address a particular beat in a score, simply enter the desired beat number. (The clock must be stopped; the frame count will go to 00.)

The next field, "insert", indicates an editing mode that allows splicing new material into a score. When highlighted (with the "E"), pre-existing material is delayed (instead of over-written) as new information is entered.

The score is advanced with a clock, which can originate from and be controlled by several possible sources. The clock may be started and stopped by positioning the cursor on "clock", and toggling it with the "E"; alternatively it can be controlled with the fourth key in the row of 14 function keys located beneath the LCD display (Underlined when on). Other control sources may be entered into the "Con" field (press"E" and select from the displayed menu). {When under MIDI control, the clock will respond to MIDI clock commands and to MIDI song position pointers (interpreting song numbers as section numbers). SMPTE control of the clock allows a particular section to begin on recognition of an associated SMPTE time code.}

The "Src" field specifies the source of the actual clock signal. In addition to the locally generated clock, {MIDI clocks, SMPTE signals, or pulses (with subdivisions of 24, 48, or 96 per beat)} can be used to advance the score. The "Step" mode directs the score to advance incrementally as notes or rests are entered from a keyboard.

The "Note Edit" facility provides a means for the addition of new notes to a score as well as the temporal modification of extant notes.

The major portion of the display is occupied by a graphic representation of the score itself. Linear time (piano roll) notation is employed, with notes appearing as horizontal lines, and accidentals indicated by diagonal leading edges. Previously scored notes enter from the right, are sounded as they cross the vertical present-time line, and disappear under the left hand representation of a piano keyboard. As new notes are recorded into a score, they appear at the present-time line.

At the bottom of the score display is a "New Data" field that contains beat markers (little white dots) and codified event markers (small vertical lines of various colors and positions) that indicate scored changes of non-note data.

In the next line is displayed data that can be stored as part of the score and that is not specific to individual groups. The first two fields indicate the current assignment and tuning tables. The libraries of these tables may be viewed by locating the cursor on "Assignment" or "Tune" and pressing "E"; repeat this action to return to the score display. "Tempo" can range from 4 to 240 beats per minute. "Interpolate" is the time taken for a new dynamic or location to assume its specified value. "Stop" stops the clock; "Next" advances to the next score; "In/Out" allows the recording mode to be initiated and terminated at precisely specified times; and "Output" has implications for the future, but serves no current purpose.

The subsequent six lines deal with data that are specific to individual groups. In the first of these lines is displayed the group numbers (color-coded to facilitate association of scored notes with groups), asteriks that indicate the record status for individual groups, and the instruments currently assigned to each group. The instrument library may be displayed by positioning the cursor in "group/instrum" and typing "E"; repeat to return to the score display.

Pitches sounded by individual groups may be transposed by values entered in the next line; resolution is one cent (1% of a semi-tone) and range is plus or minus one octave (1200 cents).

The next line's data fields specify relative dynamic and location in stereo space for each of the voices. Dynamic range is from 0 to 9; location may range from 1 (far left) to 9 (far right).

A key velocity accompanies each note and is displayed in the next line; velocities range in value from 000 to 127.

Certain analog data, generally produced by performance gestures and transmitted to the instrument via the front panel or MIDI inputs, may be stored in the score. The "Analog Source" line displays the storable sources and the record status for each source. Below this are "resolution" and "value" fields. Analog variables can chew up score memory and disk space at an dizzying pace - the resolution field permits the user to trade accuracy and continuity for memory economy. Increase the resolution (up to 9) to achieve faster response and greater accuracy: decrease to conserve memory (down to 3). Analog data can be displayed for one group at a time; the number of the group currently under scrutiny appears at the end of the line.

Up to 20 scores may be stored in the MIDAS VII score library. The bottom line starts with a display of the current score number and its title. Next is a display of the current record mode status. "Play" and "Record" can be selected by the cursor and an "E", or alternativly can be toggled by the fifth of the 14 front panel control keys. "Overdub" allows new information to be added to a group without erasing previously stored data. "PunchIn" adds a foot switch to the "Record/Play" control possibilities. The "M" field indicates available memory. Different kinds of events and data consume different amounts of memory (notes consume 10 memory slots apiece).

10.05 To create a score, first write an assignment table that assignes the desired group(s) to some voices. Add other initial conditions, and store the final table in the assignment table library. Return to the score editor and enable the group(s) for recording by positioning the cursor under the associated asterik(s) and typing "+". The yellow status marks a group ready for "punch in" recording; type another "+" to enable record status (red asterisk). Enter "local" clock control and "local" clock source (default values), change the record mode to "record" (from the panel or by typing "E" with the cursor under "record"), and start the clock (from the panel or by typing "E" with the cursor under "clock"). Play your piece and observe the entry of the notes into the score (color coded by group number).

Analog variables associated with the recorded group(s) are also recorded, but are normally not displayed. To display analog variables, position the cursor under resoltn/value and type "E". Red indicates that display of values and events (in the new data field) is enabled. Values are displayed for one group at a time; select this group by entering the group number in the Group field (lower right hand corner of the display). Individual analog variables can be recorded by highlighting analog source (with the "E") and enabling the desired variable(s) for recording (with the "+" on the asterisk(s)).

Key velocities are {{always}} recorded; they may be displayed by highlighting the velocity field with the "E".

10.10 Several means exist to position the score at a desired point. The clock can move the score forward at a rate determined by the tempo setting and modified by the panel control labeled Tempo Mult. With the clock off, the score may be directed to a particular beat number by entering the desired number in the B field, or by going to a pre-established section (see 10.30). Additionally, the score may be positioned with the Scroll control, which exhibits flywheel-like behavior and functions in both directions.

10.15 To record data (other than note events), position the score appropriately, and enter the desired data. For data to be recorded, the system must be in record mode, and if the data is associated with a group, that group must be enabled for recording.

10.20 The little chicken scratches that appear in the new data field have position and color attributes that predict their function. The little white dots mark the beats, and are predestined to appear every 48 frames. (There are 48 frames/pixel; a pixel is a single dot on your video monitor and is a contraction of "picture element".) Section beginnings and endings are coded as vertical white lines that occupy the upper or lower portions of the new data field. Remaining data types are represented by short vertical lines of one of three colors and one of four possible vertical positions. A table will provide clarity (There is ordered reason behind the scheme):

	violet	blue	red
very top	Assignment	Tune	Instrument
upper middle	Tempo	Interpolate	Transpose
lower middle	Stop or Next	Punch In	Dynamic/ Location
very bottom	Repeat	Punch Out	Analog Variable

11.00 THE PATCH EDITOR

Up to now we've assumed a somewhat traditional relationship between a gestural event (such as a key closure) and the resultant response. The assumption is that activation of a key initiates a note, and that the pitch of said note is determined by which key we strike. This was an acceptable limitation when the primary function of keyboards was the controlled launching of hammers toward strings, but it definitely inhibits the implementation of alternative performance environments and musical structures.

The patch editor derives its name from the patchcords used in bygone days to interconnect the various modules of analog synthesizers in order to establish relationships between controlling functions and acoustic variables. If such possibilities intrigue you, please read on. Otherwise skip on to section 13.00; comprehension of the patch and sequence editors is not essential to the successful application of MIDAS VII.

From the main menu, select "patch editor"; the big blank space is a window into the patch table, a menu of potential patch components appears at the bottom, and a display of sequencer status shows up to the right. A patch occupies a single line, and consists of one optional and three mandatory components. The stimulus is the event that invokes the patch - it can be the closure or release of a key, or it can be a pulse received from some external apparatus or a trigger generated internally. The destination is the target of a patch - it describes which variable we wish to influence. The datum is the actual value sent to the destination. The optional field is the definer - if not present, the stimulus calls forth the patch immediately, but if a definer is included, then the patch is not active until the definer event occurs. Definers are particularly useful for using some keys to alter the effect(s) of other keys. When there exist multiple patches with the same stimuli and destinations, the last received definer determines which patch is active.

Patches are edited on the line earmarked with the gold arrow. To create a patch, position the cursor on the first character of the desired field; the menu entries that are appropriate for that field will be highlighted. Press "E", and a second cursor will appear in the menu; locate it under the desired entry and press "E" to put it in the patch. Use the numbered keys to the upper right to enter numeric data when called for. When the patch is complete (stimulus, destination, and datum all present) deposit it into the patch table by positioning the cursor in the datum field and pressing "E".

11.10 The definer and stimulus fields are structurally identical; a key closure or release is followed by a key number (001-128), a port (local or MIDI 1 or 2), and (if a MIDI port) a channel number (01-16). Use the "3" to enter an "L" for local. Triggers may range from 01 to 16, and pulses are numbered 1 or 2. Pulse inputs are applied to the red banana jacks located on the rear panel.

11.20 Keys and triggers may be entered as destinations, and in this capacity they are actuated by the patch instead of serving as stimuli for the patch. Use edit keys "7", "8", and "9" to select data types "transient" (closure followed immediately by a release), "stop" (release), or "start" (closure). Pulses used as destinations are output pulses and appear at the orange banana jacks.

Patches may be used to illuminate the LED's (light emitting diodes) associated with the 24 local keys. Note the organization of the keys into seven color-coded groups of three or four keys each. Seven destinations, lettered from A through G are used to select these groups. Data fields consist of three or four digits, with each digit addressing one LED in the selected group. A "1" turns on the corresponding LED; a "2" turns it off; a "3" toggles it; and a "0" is ignored.

Sequencers (01-16) may be addressed by patches. Enter "SeqLin" to direct a sequencer to execute a particular line number (000-999) from the sequence table; enter "SeqCtl" to stop or start a sequencer (use edit keys "8" or "9"). More on sequencers in section 12.00.

Tuning tables 0 through 9 may be selected by patches. Registers 01 through 16 may be set to values (00 to 99) or may be incremented (or decremented) by signed values (-99 to +99). Use edit keys "8" and "9" to enter signs. Sequencers make good use of registers - see section 12.00.

The entries in the second, third and fourth columns of the menu address the same aspects of the voices as the instrument editor (section 5.00). These destinations require either a voice or a group number to be specified; use the "8" or "9" keys to select "V" (voice) or "G" (group). The group is defined by the current assignment table.

Additional potential destinations appear in the sixth column. Four programmable output voltages for controlling external devices are routed to blue rear panel banana jacks. The three phase shift parameters (section 9.35) and the modulation of a signal applied to the auxiliary input (section 9.25) are also candidates.

Four destination types exist for each of the continuous variables. A "source", selected from the last two columns, and a "multiplier" are used to attach a performance gesture (such as key velocity) to a variable. Additionally, a fixed "value" may be entered, and the "time" taken to reach a new value specified. Time data is in milliseconds, with 30 seconds the maximum permissible value (32767 milliseconds if you're a nitpicker).

11.30 MIDAS maintains and displays the patch table in a logical order. To view a particular patch, enter its stimulus and definition (and definer if used); the desired patch will appear on the edit line.

Patches may be deleted by positioning the cursor in the datum field and pressing "X". With the cursor in the destination field, this action will simply clear the edit line (without destroying the patch), and with the cursor in the definition or stimulus field, an "X" will clear the field.

12.00 THE SEQUENCE EDITOR

MIDAS VII incorporates 16 software-based sequencers. Not to be confused with score editors (which some refer to as sequencers), our version is particularly appropriate for specifying short and/or repetitive series of events that can occur simultaneously but on different time bases. Registers whose contents can be manipulated and tested as sequences progress allow certain complex interactive musical processes to be readily implemented and controlled.

The sequence editor is accessed from the main menu. The display organization is similar to that of the patch editor, with a scrolled display of the 1000 lines that comprise a sequence table replacing the patch table, and an appropriate menu appearing below. The status display on the right is identical in the two editors.

Sequence lines are executed sequentially, with the delay time specified as a time interval between 00.00 and 99.99 seconds. Three "action fields" direct various sorts of actions to be taken at the time of execution.

12.20 Key numbers or trigger numbers entered into action fields communicate sequencer activity to the sound production apparatus. Keys and triggers may be turned on or off; triggers may be requested to alternate states, and keys can generate transients (closure - release pair).

12.30 Sequencers may be proceeding (on) or stopped (off). A "stop" halts a sequence at the current line. Sequencers that are running communicate their status with brightly colored numbers (first column of the status display). A "jump to line ___" breaks the orderly sequence; the next line executed is the one contained in the jump command.

12.40 Additional action types can set or increment registers to/by one of four sorts of values; the value can be set directly (range of 00 to 99); it can be set to the content of another specified register; it can be determined by a voltage applied to one of four control voltage inputs (violet, rear panel mounted banana jacks); and it can be random. Locate the cursor under the eighth action field character to enter these action types. (This character is a "-", "+", or "=" for these register operations.) For random values, the digit following the "?" determines the possible range of values by powers of two; a 2 constrains the random range to 4 values, and a 6 allows 64 values of randomness.

12.50 Another sort of action type might be called "conditional executions". If a specified condition is met, the subsequent action field is performed; otherwise it is skipped. Registers may be compared to the same sorts of values as mentioned above. Data entry is again accomplished with the cursor located under the action field's 8th character ("=", "<", or ">"). Note that these action types may only be entered in action fields 1 or 2.

12.60 A particular line may be immediately accessed by entering the line number. Actions may be deleted by positioning the cursor in the unwanted field and pressing "X".

13.00 STORING WITH THE LIBRARIAN

We've now completed our tour of the various editing facilities offered by MIDAS VII, and its time to save our data onto diskettes for later use. It is necessary that all data to be saved on diskettes have been previously stashed in libraries. (Red colored numbers in the various displays warn the user of unstored data.) Access the main menu and enter the librarian.

13.10 All MIDAS files must be named; to name a file, enter the field to the right of "FileName", and proceed to enter from one to eight characters. Add comment to your file if desired. (Section 5.50 describes the "conceptual typewriter".)

13.20 Insert a formatted 3 1/2" diskette into the drive after confirming that the diskette's write protect mechanism is off (the program will remind you if its on). See section 14.40 for info on formatting of diskettes. Read the index by positioning the cursor on "Index" and pressing "E". It is important that you read the index after every disk change. Negligence will lead to trashed disks.

Enter a "Store", followed by entry of the record type you wish to save ("Score", "Waveshapes", "Assignments", "Hi Orch", "Lo Orch", or "Tunings"). If desired, several files with the same name and comment (but different record types) may be saved as a single operation. To accomplish this, enter the desired record types first, then enter "Store" twice.

13.30 Files may be deleted by a procedure that parallels file retrieval (section 4.0). Position the cursor on the undesirable and press "X". The file name will turn red. After confirming that you indeed want to delete this file , press "X" again, and kiss your file goodbye.

13.40 Multiple files may be expediently loaded from the front panel - to prepare a file for front panel loading, enter a letter (A-G) in the "L" column; to subsequently load labled files, activate the appropriate front panel key followed by the letter that corresponds to the desired file(s). Label only one file of each type with the same letter. To direct an orchestra file to the high orchestra, intensify its label with the "+" key (detensify with "-").

14.00 ADDITIONAL MENU FUNCTIONS

14.40 Before new diskettes can be used to store programs or data, they must be formatted. This may be accomplished by inserting a blank diskette into the drive and selecting "Format Disk" from the main menu. This process erases all previously stored data. Use only double sided diskettes, certified for double density recording. Use diskettes of the highest quality (we've found Dysan, Sony, and 3M to be excellent - avoid Verbatim).

14.50 MIDAS VII can replicate itself; insert a formatted diskette into the drive and select "Write program to disk" from the main menu. We recommend performing this operation with a freshly loaded program (minimizes likelihood of transmitting software viruses).